Remarks

Summary of Office Action

Claims 1-24 are pending in the application.

The Examiner approved drawings that the Patent and Trademark Office received from applicants on April 21, 2005.

The Examiner stated that applicants' January 27, 2006 arguments were considered, but are moot in view of the Examiner's new grounds of rejection.

The Examiner made of record Widrow U.S. Patents Nos. 4,964,087; 4,363,112; and 4,365,322, but did not rely upon them to reject applicants' claims.

The Examiner rejected claims 1-24 under 35 U.S.C. § 101 as being directed to non-statutory subject matter.

The Examiner rejected claims 1-24 under 35 U.S.C. § 102(b) as being anticipated by Widrow U.S. Patent 4,849,945 (hereinafter "Widrow," although the Examiner identified the patent as "Fowler").

Summary of Applicants' Reply

Applicants respectfully traverse the Examiner's rejections.

Reply to Claim Rejections
Under 35 U.S.C. § 101

The Examiner rejected claims 1-24 under 35 U.S.C. 101 because, the Examiner alleged, "the claimed invention is directed to non-statutory matter and is drawn to...computation method[s]...with computation method steps...which fail to show the [sic] clear concrete and tangible result or provide for output to the user." Office action at 2-3.

The Examiner further alleged that "[f]or the result to be tangible it would need to [be] output to a user or displayed to a user or stored on data media for later usage. Hence the claims are treated as non-statutory functional descriptive material (See MPEP Section 2106)." Office action at 3.

Applicants assert that the Examiner is obligated to explain why the claims fall outside of all the statutory categories of patentable subject matter. See 1300 Off. Gaz. Pat. & Trademark Office 142 (November 22, 2005) (§ IV(B)). While concreteness and tangibility are elements of a patentability standard (see 1 Donald S. Chisum, Chisum on Patents § 1.03[6][j], at 1-327, (2006)), the Examiner has merely

concluded, without support, that claims 1-24 do not meet the standard. The Examiner, therefore, has not alleged *prima facie* statutory unpatentability under 35 U.S.C. § 101. For at least this reason, the rejection under 35 U.S.C. § 101 should be withdrawn.

The reasoning underlying the Examiner's conclusion that tangibility requires "output to a user or display[] to a user or [storage] on data media for later usage" is not clear to applicants. To the extent that the Examiner's reasoning involves the judicially established rule, based on 35 U.S.C. § 101, that a claimed invention have a practical application (see 1300 Off. Gaz. Pat. & Trademark Office 142 (November 22, 2005) (§§ IV(C)(1) and (2)), applicants note that inclusion of a display or storage may be sufficient, but is not necessary, to satisfy the rule. See MPEP § 2106(II)(A) (setting forth illustrative examples of claimed inventions, several of which do not involve data display, output or storage, that are deemed to satisfy the practical applicability requirement).

Also, applicants note that "non-statutory functional descriptive material," which is a nonstatutory subject matter category that the Examiner alleged includes applicants' claimed invention, is reserved for data structures and computer program listings, which are excluded from 35 U.S.C. § 101 because they cannot by themselves manifest functionality. See MPEP § 2106(IV)(B)(1)(a). Because applicants' claimed invention is neither a data structure nor a program listing, applicants assert that it is inappropriate for the claimed invention to be "treated as non-statutory functional descriptive material."

With respect to patentability of process claims, such as claims 1-24, applicants note that the Supreme Court ruled that when a claimed invention is performing a function which the patent laws were designed to protect (e.g., transforming or reducing an article to a different state or thing), then the claim satisfies the requirements of Section 101. *Diamond v. Diehr*, 450 U.S. 175, 192 (1981). See also *AT&T Corp. v. Excel Communications*, 172 F. 3d 1352, 1358 (Fed. Cir. 1999) (relying on *Diehr*, 450 U.S. at 192, for the stated proposition). The Court of Customs and Patent Appeals ruled that geophysical exploration signals are transformable physical entities in the context of determining statutory patentability. See *In re Mehmet Turhan Taner et al.*, 681 F.2d 787, 790 (CCPA 1982) (relying on *In re Sherwood*, 613 F.2d 809 (CCPA 1980), and *In re Johnson*, 589 F.2d 1070 (CCPA 1978), for the proposition that seismic signals are "physical apparitions" despite

having been represented in mathematical terms). Applicants assert that claims 1-24 are directed to statutory subject matter at least because the claims involve transformation of geophysical exploration signals into an estimate of a formation property. For at least this reason, the rejection under 35 U.S.C. § 101 should be withdrawn.

Reply to Claim Rejections
Under 35 U.S.C. § 102(b)

The Examiner rejected claims 1-24 as being anticipated by Widrow. Claims 1 and 20-22 are independent. Claims 2-19 depend from claim 1 and claims 23-24 depend from claim 22.

Claims 1-19

Claim 1, ln. 7-10, requires computing a frequency dependent characteristic of at least one receiver signal and using the frequency dependent characteristic to estimate a formation property. In the Office action at 6, item C, the Examiner alleged that Widrow discloses

> [s]teps for computing a frequency dependent characteristic of at least one receiver signal wherein the frequency spectrum of seismic signals generated at point C of figure 1 in line 45 of column [sic] generates the speed of propagation of the seismic energy in line 65 of column 17 contains the frequency spectrum...used to compute rock formation properties of interest using equation 55a and equation 55b in lines 1-45 of column 19...

(emphasis added).

In the Office action at 6, item D, the Examiner alleged that Widrow discloses

> [u]sing the frequency dependent characteristic to estimate the formation property from drill bit vibrations in line 39 of column 19 wherein the shear waves and compressional waves in lines 5-10 of column 20 produce differences in reflection coefficient and give information about formation properties in line 10 of column 20 in combination with the drill bit 12 and measuring apparatus 10 in figure 1.

(emphasis added).

With respect to the Examiner's allegations in item C, applicants assert that Widrow col. 17, ln. 65 does not show "generation" of speed of propagation.

Applicants note that there Widrow introduces Eq. 51, which is an expression for evaluating hole deviation, not for "generating" propagation speed. Propagation speed is, rather, an input into Eq. 51. The output of Eq. 51, hole deviation, is an index of a borehole property, not a formation property.

Applicants further assert that, to the extent that the Widrow propagation speed is the alleged frequency dependent characteristic, it is not used to estimate a rock formation property via Eqs. 55a and 55b, because those equations depend on the frequency of energy radiated from the drill bit. See Widrow col. 19, ln. 9-14 (identifying the Eq. 55b integrand as "the frequency spectrum of the drill bit signal") and Eq. 55b (identifying "total drilling seismic energy" as the quantity that is right of the equal symbol).

With respect to the Examiner's allegations in item D, applicants assert that the Examiner has alleged a correspondence between the aforementioned alleged frequency dependent characteristic and alleged formation property estimates that are identified in Widrow col. 19, ln. 39 and col. 20, ln. 10.

There is no formation property mentioned at col. 19, ln. 39, but rock hardness is mentioned at col. 19, ln. 36. Widrow states that rock hardness is proportional to total drilling seismic energy. Widrow col. 19, ln. 30-32. Applicants assert that Widrow does not show or suggest that rock hardness depends on any frequency dependent characteristic.

There is no formation property mentioned at col. 20, ln. 10, which is a heading for a section entitled "Shear-Wave Drill Signals." In that section, Widrow, at col. 20, ln. 30-32, states that "differences in...reflection coefficients give important information about rock properties[,]" but Widrow does not show or suggest the use of a frequency dependent characteristic to estimate the rock properties.

Applicants assert, therefore, that Widrow does not show or suggest computing a frequency dependent characteristic of at least one receiver signal and using the frequency dependent characteristic to estimate a formation property. For at least the foregoing reasons, applicants assert that claims 1-19 are not anticipated by Widrow and request that the rejection of claims 1-19 under 35 U.S.C. § 102(b) be withdrawn.